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Journal of the Society of Arts.

FRIDAY, MARCH 7, 1856.

TWELFTH ORDINARY MEETING.

Wednesday, March 5th, 1856.

The Twelfth Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 5th inst. H. R. H. Prince Albert, President, in the chair.

The following Candidates were balloted for and duly elected Ordinary Members :—

Bagnall, Charles
Benson, Samuel S.
Brown, Thomas Jonas
Dell, William
Hall, John Paxton
Jones, Charles T.
Jones, John
Langston, James Haughton, M.P.
Milligan, Robert

The paper read was

THE PROGRESS OF ENGLISH AGRICULTURE DURING THE LAST FIFTEEN YEARS.

By C. W. Hoskyns.

A very acute observer of the minor experiences of life has left behind him the remark* that no subjects are so difficult to handle as those which are of every-day interest, and come under the definition of common property.

A very strong sensation of this truth came over my mind on being honoured by the request of the Council of this Society to undertake a paper on the recent progress of Agriculture as one of its evening topics for discussion. There is no branch of our industry to which the remark I have quoted applies so forcibly ; and if it were not that the most difficult tasks and the most discouraging results I have ever met with have been from my own soil, I should never have had the courage to undertake the task, nor that deep interest in the topic which makes pleasure vault over difficulty, and enables hope to look discouragement in the face without flinching. In fact, if I am not so much afraid of it as I know I ought to be, it is because, with the everlasting exception of my own farm, my agricultural experiences have not verified that stubbornness and tenacity which we used to hear of, but, on the contrary, every idea or suggestion forced out by the reflections that accompany a difficult practice have generally met with a freedom and openness to conviction which of itself has seemed to me to mark a sort of agricultural era, and has led me to watch with a wider interest its cotemporary development throughout the country.

Yet in doing this, and looking back upon its past history, I cannot deny that the comparative universality I have alluded to, of the topic, has appeared in some degree to lay it open to the adage that "what is everybody's business is nobody's business," diverting the eye of public interest from the landmarks of its progress by the very breadth over which its current extends; whilst other industries and arts, lying in more defined channels, are more readily marked and measured, and every invention and improvement mapped down with a precision, not so easily accorded to the progress of a national industry, which, though representing an invested capital calculated, twenty years ago, at £217,000,000,* has, for the reason suggested, reached our time with no history, no statistics, no representative in the law or the state, no board, no minister, no department, in fact, as Mrs. Gamp would say, "no nothing." So entirely unnoted and unchronicled is its progress, by the state for the public, or by the public on its own account, that if it were possible for me to recapitulate step by step all the forgotten facts of its history during the present century alone, and lay them succinctly under the eye, I do not believe there is a single branch of art or industry of which the particulars would seem to form a more novel or eventful history, or more suggestive of surprise that they should have been allowed to drop astern, as it were, in the wake of time, and fade from view; and this, too, while presenting facts surely as instructive for reflection, or foresight, as could occupy the attention of the economist or the statesman.

Before enlarging on its more recent progress, it seems desirable to premise some statement of the condition at which it had arrived at the opening of the period under review. To form a judgment of the growth one must know the original stature. For this purpose I must hasten over some ground familiar, probably, to many of my hearers.

I need hardly point to the fact that this country, whose average imports are now nearly ten million quarters annually, was, less than a century ago, doing a large trade as an *exporter* of corn to other countries ; that later in the last century than the year corresponding with this, a celebrated French economist (M. D'Angueille), quoted afterwards by Arthur Young, said that England could grow corn enough in one year to support herself for four. The twenty years elapsing between 1773 and 1793 were the turning point of our history in this respect, a sort of pivot period, when exports and imports nearly balanced each other, under almost nominal duties inward and outward. A slow but steady inclosure of land during that interval, began to mark the consumption of a gradually increasing trade and population, of which, however, we have no accurate means of computation or comparison till the opening of the present century. I may just mention that throughout that unique period of twenty years the price of wheat averaged with great steadiness about 45s. per quarter in the money of that day, when rents were from 7s. to 10s. per acre, which afterwards rose to from 30s. to 40s. Thus in the memory of men now living, the price of a bushel of wheat was two-thirds of the rent of an acre of land, not at a time of any severe pressure of war or scarcity, but under circumstances of comparative equability. It would be difficult to adduce a more striking evidence of the fall in the price of food as compared with the producing area, than the change that has since taken place.

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* "*Difficile est proprie communia dicere.*"—Hor.

* Mc Culloch.

With the year 1793 this period terminated, and, with the war, began also a succession of deficient harvests. No account had been kept of the progress of inclosure during the century; but a Committee of the House of Commons which sat in 1797 computed the total quantity at about four million acres.

From the commencement of the present century, down to this time, we have a definite record of the progress of inclosure, of population, of corn imported, of prices, and, in some measure, of the rent of land; and from these we shall be able to form some idea of the point to which our agriculture (using the term in its national or territorial sense) had arrived at the period which forms the starting point of our present inquiry.

Taking it in decennary periods, the account stands as follows:—From 1800 to 1810, the quantity of land enclosed was 1,657,980 acres, the increase of the population of Great Britain 1,506,687, and the quantity of wheat imported 6,009,468 quarters.

In the second decade, from 1810 to 1820, the inclosure was 1,410,930 acres, the further addition to the population 1,978,523, and the wheat imported 4,585,780 quarters.

Thus, during these first twenty years, while upwards of three million acres were brought under the plough, the population was increased about three-and-a-half millions. The rent of land advanced during the war to at least three times its former amount, measured at least in a depreciated paper currency. But with the close of the war, in the middle of the second decade (1815), the average price of wheat given by those fifteen years, 84s. 9d. a quarter, fell to an average of 78s. 4d. for the last five years of the same period.

These twenty years, therefore, present to our view the phenomenon of immense inclosure of land, under the stimulant of the highest prices of food ever known, except in very early recorded cases of famine, in this country. It would seem to have required no prophet to foretel the collapse that must occur when the stimulating causes were withdrawn, with the increased acreage brought under crop; yet it does not appear that this was the point that drew chief attention in the remedial measures proposed, the tendency of which was rather adverse than favourable to the laying down of land to its original pasture.

From that time—viz. 1820—the whole scene changes, and the most trying period commenced that the business of husbandry has perhaps ever known in this country; the causes of which are now more clearly apparent. Three million of fresh acres, not of the best quality, as the land last brought into cultivation in an old-inhabited country rarely is, and a circulation suddenly contracted to a metallic currency, produced a condition which no prohibition of importations was of any avail to remedy, because the competition lay, in fact, at home, in that increased acreage, held at greatly advanced rents. Nothing but the *steady increase of population*, and the still more rapid increase of trade and capital, could have sustained cultivation at the point it had extended to, nor was this done without considerable reduction of rents, though to nothing like what they had been before the war.

The best expression of this is seen in the strikingly reduced inclosure of the next ten years (from 1820 to 1830), which reached only 340,380 acres, little more than a fifth of the previous rates. During this third decennary period, the advance of the population by 2,161,495 was gradually bringing round the natural remedy to the farmer for those overdoses of inclosure which the war had prescribed; but the reduction of the average price of wheat from 78s. 4d. to 58s. 3d., accompanied by no increase of importation, shows an advanced acreable produce under a strong home competition; the rent of land gradually rising to nearly its previous mark.

The next decennary period, from 1830 to 1840, shows, in spite of the facilities afforded by the General Inclosure Act of 1835, a still reduced and almost trifling addition to the cultivated soil amounting to only 236,070 acres, less than a sixth of those first named. Still, though there were 2,249,648 more mouths to feed, and the importation, though increased, was not large, the average price again fell, to 57s. the quarter, disclosing a still further increased acreable produce against the advancing numbers.

The summary of the whole four decades, then, from the beginning of the century to the year 1840, exhibits on the one hand an addition of rather more than three-and-a-half million acres to the cultivated land, against an increase of nearly six million to the population of Great Britain; whilst the effect of the foreign supplies of wheat did not amount to so much on the average as *three weeks' consumption* in the year, calculated over the whole period.

It may be remembered that at the time when the question of the free admission of foreign corn was in agitation, it was a common prediction that it would have the effect of throwing land out of cultivation. It will be seen from the preceding account of the immense inclosures during the first twenty years of this century, that had the measure taken place at the close of that period, there might have been some ground for the apprehension on the part of the inferior undrained clays, from the fact that the increased produce, shown by the figures I have given, was chiefly drawn from a remarkable cotemporaneous improvement going on, I might almost say discovered, in the cultivation of the *lighter class of soils.* But it is equally evident, from the same figures, that from 1820 to 1840 not only was this prediction becoming every year less applicable, but, on the contrary, we were beginning to present the opposite condition of a population overtaking the resource of fresh inclosure, and compelled to have recourse to some other means for increasing the produce of the soil.

It is at this period in the history of a country that agriculture begins to assume the most interesting aspect for the purpose of our present inquiry. It is quite obvious that until this pressure arrives, until the tide of population has so risen as to cover that outlying margin which fresh inclosure brings under the plough, the mere routine of practice is not likely to offer much change, or to undergo much intrinsic improvement. As long as the deficiencies of acre No. 1 can be supplied by a mere collateral resort to acre No. 2, the same system will do, the same old implements, the same waste of manure, the same uneconomised apparatus in the field and in the fold, in the barn and in the cowshed, in the dairy and in the piggery, for the simple reason that the second inclosed acre is open to precisely the same process as the first.

But it has been and is the characteristic of our day to have witnessed in this country the comparative exhaustion of this resource. The plough can no longer strike a supplementary furrow in fresh ground; and we have seen, during the fifteen years that have elapsed since 1840, the first fruits of that opening problem, how the old furrow was to be made the arena of an increased produce, when agriculture is thrown back upon its own resources, and compelled, somewhat tardily at first, to examine those resources by the light of its principles.

No doubt this condition may have befallen other countries; perhaps in the Netherlands and in Tuscany, not to name any other, something of the same kind in the exhaustion of territorial resource may have been presented; but certainly never before in any country possessing such characteristics as this in point of capital, inventive power, industry, and skill; and there never perhaps has been a more remarkable exemplification of the proverb—that "all things are double, one against another"—than in the timely elements that seemed to spring up just when our husbandry had come to need them, more than it was, so to speak, itself aware of.

I allude to four distinct elements of new resource opening to view for the first time, almost simultaneously, about the year 1840, and which, for reasons that will presently appear, I will state in this order:—First, the introduction of the use of Guano; secondly, the publication in this country of the works of Liebig; thirdly, the establishment of the Royal Agricultural Society of England; and fourthly, the introduction of an improved system of Drainage.

My hearers will perhaps draw rapid mental conclusions on the comparative practical value of these four farmers' friends. No doubt guano is a ready friend, and a quick teacher. But who is there that does not remember the almost universal error that guano brought to light, existing in men's minds as firmly rooted as a first principle, respecting the food of plants and the nature of manures? Who cannot recal the shakes of the head with which 'practical men' pronounced condign judgment upon guano, with the hundred 'artificials' that sprang up after it, as being a mere 'stimulant,' forcing a single crop by some sort of magic, and then leaving the ground no richer than before? The very objection was a challenge, which cried out for an answer as plainly as matter could appeal to mind for explanation. The manure was come, "and the man" was needed to answer that challenge; and the man was found in the distinguished Professor, then of Giessen, whose publications, if they did not initiate, at least drew attention to, the important and new-sounding fact that the bulk of a plant being not derived from the soil, the bulkiness of a manure had little to do with its value. Let us give the honour due to our first great teacher, Liebig; though it still remained for us to learn a deeper lesson from a quarter nearer home. But this expression regarding 'artificial' manures, that they were 'mere stimulants,' was an error not in husbandry only, but in physiology. The analogy which the phrase assumed, from animal to vegetable life, was false. You cannot 'stimulate' the growth of a vegetable except by supplying it with its natural food; and whether that be conveyed to it condensed into half a bushel, or disseminated through the mass of a cart-load, the elements it feeds on are identical in either case, and the growth and substance produced are the same. It has pleased Creative Wisdom to adapt certain herbs and minerals to the faculty of producing upon the brain and nervous apparatus of *animal* life sudden and temporary exaltations of power and feeling, to meet the sudden emergencies to which animal life is subject from without; and these exaltations are followed by an equivalent depression. But no such necessity, and consequently no such capacity, exists in vegetable life. LIGHT is, in fact, in their case, the only thing to which the term 'stimulant' can, for want of a truer expression, be applied. Whatever promotes their growth is their *specific food;* and the more readily and completely a manure yields itself wholly up to the crop it is applied to, the more effectually it obeys the farmer's purpose, by the quick return of his capital, and the production of an ample supply of manure for the coming year, from the consumption of the crop that has been obtained. Mr. Lawes put this truth into few and striking words, when addressing the party assembled last year at the presentation of his testimonial Laboratory. "It is sometimes said," observed he, "that farm-yard manure possesses an advantage over artificial manures in its lasting qualities. This is a fallacy. The lasting qualities of farm-yard manure are (in a commercial sense) not an advantage; for it is getting back your money by instalments instead of getting it all at once. A great deal of your capital is placed in the land, where it lies dormant for a long time; but science can correct that evil by enabling you to put *the right manure in the right place.*"

I have ventured into this point so far, with the view of showing what a happy collateral commentary upon the introduction of guano were the translated works of such a writer as Liebig, who, whatever his after-suffered breach at certain points, when exposed to the formidable battery of such experimentalists as Lawes and Gilbert, had yet probed into nature's secrets and disclosed the theory of the action of manures, and led to that economy in the *special* application of them to different crops, the effect of which has been to institute a new business and establish a new Manufacture in this kingdom. What would our ancestors have said to the manufacture of an *artificial manure?* Thirty years ago, the phrase would have sounded about as rational as the idea of manufacturing a wheat-rick. Yet this is now a large trade ancillary to agriculture, employing thousands of hands, and proceeding upon chemical data that, before the investigations of Professor Liebig, were like an unknown tongue to the agriculturist. The very advertisements of such traders, puffing and exaggerated as they may often be, have had the effect of engrafting into the language of this new agricultural commerce, words and phrases which incidentally assert scientific facts, and involve a sort of rough introduction to the meaning and use of chemical terms for those who would, probably, obtain it in no other way.

There is nothing more remarkable than the rapidity with which the smallest morsel of practical truth, however scientific in its nature, becomes snapped up and digested into the language of commerce. The late Charles Buller used laughingly to say that the *Times* advertisements were the best light reading he knew for amusement and instruction at short notice. I often think of his words when I see the practical doses of chemistry administered to modern husbandry in the weekly advertisement pages of our agricultural periodicals. The revolution, perceptible *to the ear,* that farming has undergone from such causes, strikes me, in truth, as a 'great fact,' so gradually grown up, that it is only by certain landmarks laid down by accident, or by some of those irresistibly ludicrous mistakes which the use of new terms brings to pass, and stamps upon the memory, that one can measure the change wrought in this particular. What a long-winded sentence it used to take, for instance, to paraphrase and explain the now well-known word Ammonia, in order to rescue that all-essential 'chemical' from a certain personality of attribute which its feminine termination inconveniently suggested; and what would now be thought if my friend Mr. Paine, of Farnham, in contrasting the geological wealth under the soil with the fertiliser just named existing in the atmosphere above it, —describing, in fact, the fossil dung which he "digs out of the bowels of the harmless earth," and of its antediluvian live-stock, should narrowly escape, as Mr. Huxtable did some ten years ago, being reported as introducing *coppery Lights* into the dark places of agriculture! I can hardly forgive myself for having dropped an extinguisher on those metallic luminaries, which caught my eye in a version of a speech that chanced unluckily to come across me before publication, with that now well-known mineral super-phosphate, the Coprolite, thus brilliantly introduced to the farming world. But to return.

The third element of progress I named was the establishment of that powerful engine of agricultural improvement, combining both the stationary and portable character, the Royal Agricultural Society. If I were asked to name, in a breath, what I regarded as the greatest achievement of that important body, I should say that, like Aladdin's lamp, it has summoned up a new race of potent Genii, and set them all at work for the farmer. If any one doubts that fact, let him contrast the Exhibition of Agricultural Implements collected by its first Meeting, in 1839, at Oxford, where the entries were twenty-two, with that which took place in 1852, at Gloucester, where they amounted to no less than *two thousand and thirty-two!* What would have been thought only ten or twelve years ago, of the facts disclosed in letters received last year from several of the great firms of English agricultural machine makers, whose engines we were unable, for lack of space, to select for the Paris Exhibition, viz., that being in the habit of exporting from *one to two hundred agricultural steam engines* a year to different parts of the Continent, the non-appearance of one of their manufacture amongst the prize engines in the French Exhibition would operate unfavourably to them with their foreign connection. And these, be it noticed, were the "*un*successful candidates," the less brilliantly distinguished amongst the decorated throng of prize and medal winners. Such a fact speaks volumes. As it was impossible, of course, to accommodate all, in the space allowed us, of 4,000 square yards, in the Exhibition, the only thing left was to 'bear it in mind,' which I have done ever since, and now beg to offer it as a specimen "highly commended."

The fourth element I named was Drainage. To this I shall have to return.

I refer to these four prominent agencies, presenting themselves to our review, as cotemporaries, not in the tone of an exclusive citation of particular causes, for the causes co-operating with them have been many, much less with the object of stringing upon them a dry chronological narrative of facts. The use of the past does not lie in its catalogues of annual occurrences, little better for our purpose than an almanack or obituary. The review that gives back life and value to bygone events consists in their analysis, for present information and future guidance; and, following that vein of thought, the causes I have named as dating their origin about the same period (1840), suggest to mind the two great heads into which agricultural improvement naturally mainly divides itself—viz., the Chemical and the Mechanical. And I confess that when I see the extent to which the use of 'chemical manures,' so to call them, has been carried upon the light turnip-husbandry soils—upon those vast Norfolk plains, for instance, which the names of Holkham, and West-acre, and Castle-acre, bring to mind; where the manure-merchant is the largest landlord, amongst the large, and the heaviest rent his 'little bill,'—I cannot help identifying those two divisions I have named, with the two classes of soils which form almost separate codes of agricultural practice in this country, and whose history and experiences are so widely different—viz., the Light soils and the Clays.

It must be obvious to any one who considers the nature of our climate, that the treatment of the heavier and more tenacious soils presents by far the greater difficulty, and one that would be the latest surmounted in the natural progress of labour or invention. But the mechanical disadvantage presented by the clays is not the only one, nor the worst. Few men prefer a difficult task to an easy one. Few men, under a weeping sky, prefer a soil which is for ever turning rain into a foe, to one where it is not only a friend, but an ever welcome one. Few men prefer a soil upon which, whatever its boasted mineral superiority, that "beast with golden feet," as the Sheep is called in the Persian proverb, gets its four golden extremities screwed into the ground, like the table of a ship's cabin. The consequence is, that we realise upon the clays a sort of travesty of the saying of the old poet, who says that "Love alights with ease on wealthy places."* We find, conversely as it were, that "Wealth alights with love on easy places"—in other words, that every farmer who has capital enough to manage a clay farm in a capital way, goes travelling about in search of "a sheep and turnip farm." In the track of capital follows, I fear, the main average of intelligence and skill, settling, like the Monks of old, upon the choicest spots, where the struggle with Nature is not only lighter, but spreads its easier task over a *longer* and more leisurely year of *twelve* uninterrupted months. The statistics of the rain-fall of this country, of which, happily, we *are* in possession, show that the quantity of rain which falls in the west of England is nearly twice as much as in the east, and that the farmers of the midland and west-county clays have thus had another disadvantage to contend with in their plough-lands; and that the causes which, in the early part of this century, occasioned so much land, which formerly was pasture, to be broken up for corn, in those districts of the kingdom, bequeathed for many years a forced application of the soil, not easy to correct without too long-continued a loss for tenant-farming to encounter. Stiffer land, more rain, a shorter working year, less capital, with its too frequent concomitant, less skill and intelligence, present a formidable array of disadvantages against the heavy soils, in taking a comparative review of our means of advancement. To this the one reply has been, Drainage. But if the drainage statistics are only half true, which we heard read in this room not many weeks ago, the advanced knowledge of this art has sadly outstripped the practice, and what has been done is little compared with what remains to do. What are two or three millions, or five millions, of public money spent in drainage? Would *one hundred* millions drain, at £4 or £5 an acre, all the clay soil, pasture as well as arable, in Great Britain, now undrained or badly drained, and the draining of which would pay 10 per cent. and 20 per cent. upon the outlay? What *can* be the cause that,—in a country which has sunk nearly its three hundred millions sterling upon railroads, that scarcely pay back their 3 per cent. upon the outlay,—stints and diverts the free flow of capital from a channel as safe, as certain of return as the arterial blood, to the heart and inner sustenance of the nation?

That this is a matter involving serious points of consideration will, I think, appear from the following facts:—

During the seven years from 1840 to 1846 inclusive, our imports of wheat had advanced from less than one million quarters per annum in the previous ten years to very nearly an average of two millions; while from 1846 to the present time, under the development of an unrestricted trade, they have advanced to nearly *five million* quarters per annum, or more than half of the whole imports of foreign grain. Now, inasmuch as the wheat crop occurs only once in the four-course system of the Light soils, whilst upon the clays, whether managed upon the six-course system or upon the older three-course shift, it is grown upon a larger oddmark, approaching to the ratio of a *third* instead of a *fourth* of the arable land, and is, therefore, looked to by the farmer as furnishing the profit, which on the light soil is drawn from the wheat and barley crop together (besides a wider range of profits derived from the sheep flock); it seems obvious that the improvement of the clay soils to their utmost extent is the special, I should almost say the only, means left to us for operating in any important degree to maintain the produce of wheat in proportion with our increasing numbers.

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* Soph. Antig: 582.

The population of Great Britain at the last census in 1851 was twenty-one millions; during the five years ending with that year, the imports of wheat had averaged four-and-a-half million quarters, thus giving about eleven weeks' consumption instead of three weeks, the quantity I named as supplied by importation during the first forty years of the century. But, it must also be borne in mind, that not one quarter of imported corn do we obtain except by its equivalent in additional labour at home, the wages of which will still be mainly spent in the purchase of fresh supplies of food; whilst, therefore, the extra demand is so far cumulative, the home grower can only avail himself of it by meeting it with an extra produce obtained from the soil at the same cost. We have here indeed a challenge to the improvement of the wheat soils. Drainage first, and some new mechanical aid not yet divulged, are the only resources we can look to with reasonable prospect of success.

It would be, beyond all expression, interesting, if on looking back over the last ten years of increasing population and enormously increased imports, we had any possible means of ascertaining the statistics of our increased home produce; but for this invaluable retrospect we are without the shadow of progressive data. The weekly returns of corn sold, which regulate the averages, are too imperfect and manifestly untrustworthy to be even worth alluding to; and beyond these we have literally nothing approaching to a guide to go by; all we can do is, to look at our improved implements of husbandry, and their immensely increased sale, indicated by an annual exhibition augmented a hundred fold, from *twenty* to *two thousand*, as a subject of indefinite congratulation, which it is out of our power to estimate, as we should like to do, by an annual table of recorded results. This would be a practical and complete test. But instead of this, we are in the position of a Manufacturer who shews you the quantity of fresh machinery he has put up, the new inventions he has made or purchased, the extra hands he employs, the increased number of his customers, and the superior economy with which his work is accomplished, but can furnish you with no account whatever of the produce! Whoever wishes for an almost provoking argument for agricultural statistics, let him look at this now irreparable fact. In vain do we point to the almost perfected specimen of the Plough, from the manufactories of a Ransome, a Howard, a Ball, or a Busby; to Garrett's horse-hoe; to Hornsby's drills; to Benthall's broadshare; to Coleman's cultivator and scarifier; to Chandler's ingenious water-drill; to Croskill's clod-crusher; to the nearly, but not quite, perfected Reaping machine; to our splendid late improvements in steam-driven barn-works, completing at once, and in the compass of a stage-wagon, the whole operation, from the thrashing of the corn to the dropping it into the sack, winnowed and cleaned, and ready for market, recalling, to the above distinguished list, the names of Clayton and Shuttleworth, Exall and Andrews, Humphris and others. These names are but a few even of the most prominent among an army of Titans eternally waging peaceful war, whose machines, like a "list of the running horses," at our annual agricultural Olympics, approach each other within the narrowest shades of differing merit. We witness all these fresh accessions of mechanical economy to the various details of husbandry practice, but what their joint comparative effect *has been* upon the national produce we cannot tell, and, what is worse, shall never know. But this we are able to see, that, with the exception of the inimitable Clod-crusher, almost every mechanical improvement I have named is, more than at first meets the ear, addressed to light land culture. First, because a great proportion of them are adapted to the larger holdings, more rarely met with on the clays. But let me take, for instance, that useful class of instruments represented by Benthall's and Coleman's scarifiers for *Autumn cultivation of stubbles*, one of the greatest improvements of modern practice. The farmer of the clays may listen with admiring envy to the virtues of an instrument whose wholesale power of extirpating the annual weed crop bids fair to reduce the Bare Fallow to its narrowest necessary limits, but in the majority of seasons he dare not use it. The utmost exertion of his team is required to get his ploughing done, and his wheat sown, in the few weeks after harvest when his land is in proper condition for tillage. Had he but an implement that would work *night and day* during those critical six weeks of September and

October after his grain is harvested, and before the November fogs and rains set in, he would, indeed, be a debtor to mechanical skill; but the want of this leaves him often overtaken by the approach of winter, with many a task unfinished that comes with redoubled pressure upon the hurried days of Spring-time. I say that this is the specific want upon that large portion of the arable land of this kingdom which the character of our climate renders unfit for winter cultivation. The effect of drainage, even when most perfectly performed, is only comparative. It modifies the evil, but does not cure it. "We have scotch'd the snake, not killed it." Besides, the glazing passage of the plough through a clay in winter time is often detrimental to the operation of the drains; and the elongation of the modern mould-board, one of the features of its improved form, is an elongation of that glazing action, showing that even its very points of excellence and finish—for light land culture—are, to some extent, negative upon the clays.

Unless the mighty power of Steam will befriend us here, I see no loop-hole of escape from the unequal struggle which has been going on, and is every day widening the distance, in the race between the light soils and the heavy. The resources of the light soils are more readily available, and *followed out through the year*. The turnip crop, fed off by an ample sheep flock, with the collateral advantage of the barley crop, renders their quadrennial wheat-crop a thing of almost attained excellence, whilst, in their case, of far different comparative importance to the place it holds upon the clays.

I do not deny that, when I look at the new and extraordinary powers which the use of guano holds out to the heavy land farmer, and not guano alone, but every artificial fertiliser which, like it, can be *applied by hand to the growing crop*, leaving no track of horse or wheel, during the wet months of winter, and rendering these naturally rich staples almost independent of "courses" and "shifts," as they are called, I see a power of almost indefinite increase in the wheat crop (for whose enlargement we must look to that quarter), could we only overcome the mechanical difficulty, the two-fold problem of hard work and shorter time, in their preparation. That it can be overcome I do believe; that it is worth the effort, not only of a Company, but of a NATION to overcome it, I foresee. To no other country is the problem presented, under the necessity which enforces and *compels* its consideration and solution upon our large acreage of clays, with such a weeping winter sky above them, yet such inexhaustible capabilities within them. The celebrated seven-acre field at Rothamsted, and that perplexing Eden of mystery at Lois Weedon, differing in other aims, agree in this, in showing the unfailing annual produce which a wheat soil, *unmanured*, will give, *according to its tillage*, if kept free from weeds.

What, then, might not be accomplished on the clays, if, to a more specially adapted mechanism of tillage, we should add the revision and partial abrogation of an ancient system of cropping, and covenants for cropping, which the introduction of Guano has, to a great extent, rendered obsolete. When we consider the primary rank of the wheat crop as the direct human food, and the peculiar capacity of the Scotch and Irish climates for the production of oats and other inferior grain, evinced in the statistical returns that have appeared of those parts of the United Kingdom, is it not forcibly indicated that no blind adherence to custom, or rotation, should prevent our stronger class of soils being put to their full capacity, being *worked on high-pressure?* Nor can I see why the farmer of the clays should be forbid to do as the manufacturer does,—adapt his produce to the market, and turn guano into wheat as fast as the machine he hires will enable him. The idea of "exhaustion of the soil" is a chimera. Let it be only kept free from weeds, the true exhausters of land, and the simple equation remains, that so much applied Nitrogen* will produce so much Wheat, and, when that is reaped, and the land is ploughed and cleaned, the same dose of nitrogen will occasion the same result again. If the question be still asked, what chemistry has done for agriculture? let the most original and practical authority in this or any other country on that subject, Mr. Lawes, point to that simple fact which he has discovered and proved. The controversy which has made this important discovery memorable, has had the singular fate of outlasting its field-proof and practical adoption in this country. 'Nitrogen for wheat, and phosphates and sulphates for turnips,' has received the stamp of successful practice, before the battle of theory has been brought to a close. But Chemistry has a fair right to its *Retorts;* and it would be ungrateful to suppose that our debt to Professor Liebig is cancelled or affected by the practical disproof of his opposite theory, whose original announcement, regarded as part of a grand research into the principles of manure, awakened attention and investigation to the point, and has thus conferred such lasting benefit on agriculture, "bringing, with its surcease, success." The experiments, too, of Mr. Thompson and Professor Way, resulting in the discovery of a specific chemical relation between ammonia and the silicates of alumina, have strengthened our practical reliance on an affinity, the importance of which, in the culture of clays, can hardly be overrated. Regarding the atmosphere as the proved storehouse of that element, shown to be the special food of cereal crops, and repeated fresh exposure of the soil as the surest invitation to its absorption, this subject has become the meeting point in our day of the chemistry and the mechanics of agriculture, reflecting new immortality upon the labours and guiding instincts of Jethro Tull, carried out as they have been to more accurate demonstration by the unvarying personal success of his modern illustrator and improver, whose "word" is every year "in season," with four quarters and a half per acre, on the garden-farm of Lois Weedon, which still produces its annual crop, of wheat without manure, and followers with partial success.

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* The term will, of course, be understood only in its popular, *agricultural*, sense. In strict chemical language a manure can only be regarded as an exciting agent; a cause enabling by its presence the result of certain combinations.

But to return to the mechanical question. I shrink from speaking of myself; but let me not be thought to have slackened upon the great subject of steam culture. I have watched the spread and progress of the question from the time when its very name produced a smile, and have lived to realise a certain prophecy, that the time would quickly come, when the reclaim of the thought would be the harder task amidst the throng of speculators on the subject, each enveloped in the believed originality and perfectibility of his own idea. But it is a task which far exceeds, for its accomplishment, the power of a single hand. If all who nurse ideas upon the subject would but agree to sacrifise a little of that self-reliant individuality with which nature has gifted inventive minds, and those who pronounce upon the merit of whole catalogues of others' patents would but sink a little of that generality of which she has been equally liberal to minds that are not inventive, this invaluable object would be on the right road to its accomplishment, and England might add that *one-fourth* to its wheat crop which it now purchases abroad. The October temper of a clay soil will not wait while horses are eating and sleeping fourteen hours out of twenty-four; and the substitution of a power that needs no rest, at that period when the soil says, "Now or never," is not so much a question of economy in money as in *time*. I cannot desert the principle that that particular *mode* of turning the soil peculiar to the plough, is the mere relative necessity of a particular tool, that it may be done and is done in other ways, and that it will be done with less expenditure and waste of power, in detail, beginning from the top, as the planing-machine would eat through a board, than by upheaving the furrow-slice from the bottom, upon the hardened fulcrum of a subsoil already too compact and impervious; and lastly, that by so performing it in detail, the object of *cultivation*, supplementary to that of inversion with the plough, is incidentally comprehended in one operation: a confirmation, to my mind, on the principle of the occult relations of mechanical truth, that the suggestion is a right one. But an union of thought and action, and of all the sinews of enterprise, is the course that indicates itself for the accomplishment of this now widely-cherished object. Could the inauguration of such an union be ever more appropriate than in a place and in a presence, which recall to mind the greatest union for the sacred international brotherhood of industry and art, that time has yet witnessed?

I turn with natural interest to such a machine as Fowler's Draining Plough, with its happy incidental adoption of the lately-invented wire rope, and that most suggestive and satisfactory feature which it embodies in its stationary engine. It is impossible to see this, or, indeed, to read its inventor's practical remarks on steam culture, lately delivered here, without recognising in it the outline of something which may relieve our clay soils as much from the pressure of heavy hoofs and wheels on the surface in the act of cultivation, as his iron-strung necklace of pipes relieves their moisture from below, cutting through the subsoil like a cheese. It is upon the Steam-engine in every form, as it gradually wins its way from the fold into the field, and from the one engine that smoked in our trial-yard at Bristol in 1842, to the *fifty-seven* that stood in row at Lincoln, waiting to prove their speed and power by Mr. Amos's perfected Dynamometer, —it is upon this power that we must rest our hopes, for that mechanical progress of agriculture which our climate and our clay demands, and our mines of coal and iron, with equal speciality, present the means of.

There is one striking feature which has marked the period we are looking back upon, and has perhaps attracted the notice and interest of the non-agricultural world more than any other, and will hereafter become perhaps a distinguishing landmark of the time: I mean those numerous Example Farms, which, spreading gradually from one or two isolated instances, and weathering a somewhat rude storm during the range of low prices reaching from 1847 to 1852, are now sufficiently numerous to be said to afford a specimen almost in every county of what can be accomplished by a resolute enthusiasm in the adoption and carrying out of all the improved resources which capital and general intelligence can bring to bear. I use the term general intelligence, as distinguished from practical farming knowledge, not as at all denying the latter qualification, often in a very high degree accompanying the effort, and always gradually attainable, but because I shall not, I think, misdescribe the object and idea of these really patriotic establishments, in speaking of them as the pioneers who, generally speaking, have explored untrodden paths, and whose more prominent labours and results have been perhaps too much mistaken by the public eye for a general movement of the main line and body of our agriculture, to which they form a sort of advanced company. If, however, foreigners express themselves in terms of admiring astonishment at these examples of applied capital and skill, which they are taken, from one to the other, to visit, and from which, as in the case of that careful investigator and flattering eulogist of British agriculture, M. Lavergne, they naturally gather so high an estimate of our general progress, I think they would be not less astonished could they be made aware how large the bulk of farming is in this country which is literally unreached by the very echo of what is being done even within a few miles of its boundary fence. The terrible *per contra* that might be shown, if a balance were struck of the *acreable proportion of best farming* against the worst, is a subject that would be surprising to those who judge of the whole contents of the basket by the plump rosy apples that lie prominently at the top. The fact is that the revolution which has been taking place in the agriculture of this country presents, like the planetary motion from which the term is borrowed, a *centrifugal* as well as *centripetal* action; as the heavier capitalled portion, which has come to regard the soil as a mere arena for investment, has approached nearer to the utmost limit of profitable produce, a large outer circle of those who vainly persist in looking upon a farm as its own capital, are clinging on to holdings far beyond their means, and to a system which every invention and every improvement and every addition of capital to agriculture renders more untenable. The condition of the hand-loom weavers after the introduction of the power-loom, more obvious and sudden in its operation and the struggle it presented, was not more hopeless in principle. I fear no honest portrait of the condition of English agriculture could be given which did not include this shadow upon the back-ground. It is the result of an inflexible law, which no philanthropic regret can avail to alter. It is true that capital cannot be applied profitably to agriculture beyond a certain limit, as Mr. Lawes has shown by a simple table that submits it to the eye as plainly as an equation, so far as the growth of cereals is concerned; but the proof lies at a point so high, so far above the ordinary scale of farming, that for the present question it is as though that limit did not exist. Every description of improvement that we hear of with so much welcome, can only be of use so far as it tends to lower the cost of production. With every step in that direction the profits of the unimproved farm, of the uncapitalled occupier, are threatened to be left high-and-dry by the sinking level around. No advance of population will come to the aid of this. Occasional high prices, like the present, mask for a while the operation of this law, but in the long run it will be found that the market will not wait for, will not rise to meet the exigencies of a high cost of production. The "Mountain will not come to Mahomet." The remains of *the profit* still left to us, lie poised between two elements, and the *miracle* consists in escaping a collapse—viz., between the over-cost of cultivation and the under-level of the market price.

Nor does this apply to the occupier alone. Our system of landed settlements, like the cropping covenants in farming leases, are the creation of a period when the mere tenanting of a farm was a boon, a sort of grant, by which an old servant or dependant might be pensioned off, when, to use the shortest phrase, the land was its own capital. It now approaches much more to the character of a mill, in which, if the best machinery be not put in, the balance of profit is lost in useless labour and wasteful expense. Reaching the occupier first, it is yet upon the Owners of settled property that the impact of this movement ultimately falls. Improvement is not a choice—it is an imperative necessity. We have tried to reach the case by Government grants for drainage; but drainage is a mere first step, implying a succession and round of investment in the soil, in stock, in buildings, in barn-works, in additional hands, even to *furnish* the farm with its complement of requisite machinery. The annual loss which this country, with all its prominent and boasted agricultural improvement undergoes, by the tied-up hand of ownership, which settled estates, without proper powers for improvement both to owners and trustees, and land held under ecclesiastical leases, with the injurious system of septennial fines on renewal,[*] too extensively exhibit, is a subject that sooner or later must find a tongue, and a more efficient and constitutional remedy than government grants, which struggle with the effect, but leave untouched the causes which they incidentally recognise.

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[*] "AGRICULTURAL IMPROVEMENTS.

"TO THE EDITOR OF THE TIMES.

"SIR,—The comparative state of waste in which many large estates are kept by the want of improvement, is a loss to the country of considerable magnitude, and much good may be done by your exposing such an instance as I am about to relate, and which the experience of many of your readers, who have to deal with church or college estates, will say is not singular.

"The Dean and Chapter of ——— are owners of extensive farms, let to tenants on leases for 21 years, which it has been the custom to renew every seven years at a low rent, on payment of a proportionate fine. The general bad condition of properties so held is notorious. These gentlemen not only set their faces against parish improvements to which they may be asked to contribute—and upon this much may be said—but it will appear they are such enemies to innovation, that they not only refuse to assist their tenants in improving their farms, but will not even give them the opportunity of doing so at their own cost. I am the lessee of a large farm of theirs in Oxfordshire, which might be made very productive, but which is now almost a waste, and I am debarred from improving it by its want of draining; I, therefore, lately applied to the steward to aid me in obtaining a Government loan to drain it, expressing my willingness to pay the whole of the rent-charge during my occupancy of 21

An almost exhausted hour—I fear a quite exhausted patience—warn me to a brief conclusion, while the hydra-headed subject I have merely approached stares me in the face with its numerous and various topics, rising thicker and thicker to my view still untouched upon. Looking back over the space of my own, however limited, experience, and purposing a sketch, I have encountered *a history*, which no effort at compression could reduce into the narrower space I would gladly prefer. One subject alone I cannot end without a parting word upon, and that shall be as short as those words can be which carry long thoughts. When the cares and difficulties of an intractable soil first drew me from other studies to that of agriculture, what was my dismay to find that *books* were looked upon as the very rocks and shoals ahead to be *avoided*, not consulted, by the home mariner, the plougher of the land, who would escape shipwreck. Strange paradox! Yet of all the prejudices to be surmounted this seemed surely the most difficult, which would cut off every chart of information beyond that which the solitary steerer already possessed, or saw around him, in however wild a latitude. It is still, indeed, true, as so discriminately pointed out by one whose toiling and valued pen has ceased among us—PHILIP PUSEY—that books will not teach practical farming; but neither, as he justly rejoined, are they a substitute for the apprenticeship of daily practice in any other pursuit. Yet, luckily—as no man better than the farmer knows—'knowledge is no burthen,' and the boy who whistles at the plough, or the man who holds it, much more the master who directs it, walks none the heavier, observes none the less acutely, draws truth from nature none the less easily, is none the less "in league with the very stones of the field," though all "Morton's Cyclopædia," and Stephens' "Book of the Farm," were sublimated into his brain. It would be toiling over a stale furrow to argue the point again, but it is impossible for me to look back over the period I have spoken of, without a keen sense of gratitude to the bold and brilliant pens that have broken through a barrier threatening to immure husbandry within the solitude which is in truth, its own greatest deprival, and in some degree inseparable from its steady and industrious pursuit, apart from the civilising thought and intercourse which the 'city mouse' enjoys. But who is there whose labour is not cheered and lightened by the words of those who, too far away for personal intercourse, are yet struggling with the same task as himself? Whether the scene lie among the now too classic fields of Pusey, in Berkshire, or amidst the liqui-fertilised and startled acres that once bore the dry and barren name of Tiptree-heath, in Essex; whether we imbibe long draughts of chemistry from the fountain-head at Rothamsted, in Hertfordshire, or seek a *too short* oblivion, or enjoyment, of 'Present Prices' upon the chalky downs of Dorset; or whether, deserting these hospitable homesteads, invited by the active spirit of the times, we start forth upon a general commission, with the "chiel amang ye taking notes, from the Solent up to John o' Groat's;"—do we find that such fireside companions as these diminish our practicality, or invade our winter evenings

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years. It may be necessary to explain that the Government advances money for draining, to be repaid by an annual rent-charge of 6½ per cent. for 22 years; but to obtain this a leaseholder for 21 years must get the lessor to join in their application. One would think that, as I am the lessee at a nominal rent for 21 years, and the money is to be expended in the permanent improvement of the land to at least the extent of the rent-charge, the lessors would be most happy to join in an application by which they would get their land permanently benefitted, at the expense of the tenant, to at least the extent of the outlay, namely, about £5 per acre;—I say to at least the extent of the outlay, because it is only on condition that the draining shall benefit the land to this extent that the Government advance is to be obtained; and, in addition to the benefit from the draining, the land would further have the advantage of the other improvements which the draining would lead to, but which its present wet state is a bar to. But no! the steward sees the possibility of the dean and chapter having to pay the rent-charge for one year at the end of 21 years, and does not see that by that time the estate will have been benefitted by my having made 21 payments out of 22, and that I am desirous of incurring the rent-charge for 21 years, from seeing that the farm must each year be benefitted more than the additional rent I undertake to pay, and at the end of my lease the lessors would come into the improved rent my outlay would have created at the cost of one year's payment; and so, by this refusal, I must continue to hold the land in its present unimproved condition for 21 years, and the dean and canon will, at the end of my lease, find their farm remaining in its present comparatively valueless condition, and thus their future representatives are being deprived of the improved rent which their joining in the application would secure them. But, perhaps, it may be said, seeing the advantage is so great, why do I not lay out the money myself? To this there is this unfortunate objection:—Were I to do so, when the time comes, seven years hence, to renew my lease, the same steward would be the first to assess the farm at the improved rent my outlay would have created, and thus I should increase the fine I should have to pay by my own act, and this, I think, every one in my position would decline doing.

"You are, doubtless, aware that the consumption of corn by this country has now attained to such an amount, that we require the assistance of about 11,000,000 quarters per annum of foreign growth; and, this being the case, is the production of the large estates vested in trustees for the public advantage to be kept down in this way by their worse than ignorance of their duty to their tenants, to their successors, and to the nation? I think you will see in this a subject of general importance, and I trust I need not further apologise for troubling you and asking you to insert this in *The Times*.

"I remain, sir, your obedient servant,

"T. R. B. C.

"Northamptonshire, Jan. 11, 1856."

less usefully and pleasantly than the *Gazette*, or *Express*, or *Messenger*, or other weekly page which brings us tidings of the markets of the world, to which not more the trade than the mind of British Agriculture has been opened? I, at least, for one, must acknowledge that in the steady and progressive change which "Practice with Science" has wrought upon the aspects of English farming during the fifteen years past, the most striking, the most complete of all has been, where I saw most to despair of in the outset,—in its LITERATURE, both practical and scientific (for even in its literature these two classes must co-exist). Did I need a token—a convincing attestation—that in the threefold character of farming, as an 'Art,' a 'Manufacture,' and a 'Commerce,' and, let me add, an *Education*, its interests and progress are *felt* as among the highest objects of the highest minds, —in the spirit, if not the words, of a well-known epigraph, "*Lector, si* indicium *requiris, circumspice*,"—I might gratefully recognise it here, before my brother-members and the Council of this Society, and the Presiding presence of one who, amidst the absorbing avocations of a life devoted to the promotion of the useful, the beautiful, and the good, has practically earned, and freshly dignified, a name associated of old with the Throne and Royalty of England—the name of a British Farmer.

DISCUSSION.

Mr. J M. PAINE, of Farnham, said—Having been honoured by the invitation of the Council to speak a few words on the Geological resources of Agriculture, I will not occupy the time of your Royal Highness and of the meeting by any further prefatory remark. I fear that it must be admitted that geology has not hitherto done much for agriculture, and although its resources are manifold, that it has not done what it ought and might do. Still some good things have been effected by its means, and more particularly within the fifteen years of the interesting review so ably presented to us by Mr. Hoskyns. But geology without the aid of chemistry as an interpreter will not profit the farmer. Chemistry must tell us what to find, or when we have found it what it is, while geology teaches us where to search for it. It has been said, however, in disparagement of such combined investigations, that the knowledge of the constituents of the true geological subsoils is of little value, inasmuch as the greater part of our cultivated fields is composed of superficial drifts, oftentimes differing widely in character from the soils they overlie. That this is usually the case is most true; and still more these drifts are generally of so mixed a character, that it is not likely we should obtain much advantage from a chemical knowledge of their ingredients, as such information would not admit of general application. Geology, however, would here serve agriculture in another manner, by teaching the extent, depth, and direction of these diluvial drifts; and this knowledge is often very useful in the drainage of land. I need scarcely remind my present hearers how this has been signally and successfully exemplified in the case of Lord Berners, at Keythorpe. On a much humbler scale I have derived similar benefit in draining some of my own land at Farnham. But I consider that agriculture would ultimately reap many advantages, did it possess an analytical knowledge of the true geological subsoils as they outcrop in various parts. From my own experience, I can confidently state, that the soil of one field is frequently the most appropriate manure for another. And it sometimes happens that examinations of this nature lead to the discovery of beds of peculiar substances, which act as specific manures, and will bear the expense of distant carriage. Such discoveries have been made, and, I think, there are sufficient grounds for indulging in the sanguine hope that a more diligent research would be rewarded both by pecuniary and scientific success. In confirmation of this opinion, I need only remind you of the several sources of phosphates which geology has already developed, and many of which agriculture has wisely appropriated to its use. It is sufficient merely to name the mineral phosphate of lime which Dr. Daubeny introduced to our notice from Estramadura—a name about as happily chosen as the "coppery lights" applied to my friend Mr. Huxtable; the so-called coprolites from Suffolk; the phosphatic nodules from Cambridgeshire; the fossils and nodules of the upper and lower green sand from Farnham, and the base of the chalk-hills generally; the mineral phosphate from New Jersey; and, lastly, and perhaps the most important, a very pure *apatite* recently imported from Norway by Mr. Lawes, from which super-phosphate of a most superior quality is now manufactured, containing from 30 to 40 per cent of the soluble phosphate of lime. These discoveries are due to geology, and I think they ought to stimulate us to undertake more complete investigations; and I confess that I should heartily rejoice to see set on foot a carefully-conducted chemico-geological examination of all the subsoils of this kingdom. I have endeavoured to commence this task, so far as relates to one well-known geological division—I mean the chalk; and having obtained the eminent chemical assistance of Professor Way, I have hitherto been well rewarded for my pains. The Royal Agricultural Society, I am persuaded, would willingly assist gentlemen in kindred investigations, and if this recommendation were systematically carried out, I believe very valuable results would ensue. Might we not hope to discover in our granitic districts rich veins of phosphate of lime like those I have just mentioned? For phosphoric acid is of frequent occurrence in these rocks; it is, I imagine, one of the primeval existencies of our globe, as it in fact constitutes a large proportion of that "dust of the earth" out of which man and all other animals were created. Geology, too, with the help of chemistry, has shown us on what lands to grow specific crops. It is well known that the peculiar botany of any district is chiefly determined by its geology. So also does it indicate the description of agricultural crop to be cultivated with profit and advantage. I may perhaps be permitted to illustrate this remark by reference to the growth of the hop, a perennial plant requiring the richest soil. Until I brought geology and chemistry to bear on some of my own fields, they did not pay me 5s. per acre rent. I compared their soils, both geologically and chemically, with hop grounds worth £20 per acre, and I found them alike in geological position and chemical analysis. There now remained only one obstacle to their being placed in a very different category of value—that impediment was water;—the land was deeply drained, and the fields became worth £10 per acre. My attention, as I stated just now, has been more specifically directed to the chalk formation, as my land affords peculiar facilities for its examination. In a section of about two miles, running from S.E. to N.W., I obtain every outcrop, from the low green sand to the plastic clay. These have been examined, as it were, step by step, and we found beds of phosphate of lime, clay with a large per centage of potash, thick beds of the soluble or gelatinous silica, and carbonate of lime in every variety. Some of these carbonates of lime strata furnish an excellent marl, as they are intimately commingled with alumina, potash, silica, and phosphoric acid. This marl is applied to other parts of the farm whenever opportunities offer for its transit. It is a marl of this description in the lower chalk which has been so abundantly used from time immemorial throughout the south of England, and probably to a greater extent formerly than at the present time, if we may judge from the immense old marl pits of this district. Here, as in many similar instances, practice derived from experience first indicated a rich and peculiar soil, the real value of which was not known until science told us what were its ingredients and their fitting application. The soluble silica beds of the chalk form a very remarkable soil. On my farm at Farnham, they are about 100 feet thick, and from the lower to the upper member of the series, the per centage of the soluble silica ranges from 20 to 76. This substance has not received much attention hitherto, either from agriculturists or chemists; indeed, prior to this discovery, soluble silica was far too costly an article to be employed for agricultural purposes. If it be useful, it can now be procured at a very trifling expense. I use large quantities of it on my farm, and immense quantities are used in the neighbourhood. The soft parts are spread like mud over the fields, or employed as a covering to, and as a bottom to dung-heaps, and also to spread over the bottom of the fold-yards and farm-yards. The hard parts are dried, and ground up into a fine powder. This is used to absorb the urine in the tanks, and to litter up the fattening pigs, as a substitute for straw. It thus forms an excellent drill-manure for root crops. As an absorbent and deodoriser it is equal to charcoal dust, and I need scarcely add, that it is much cheaper. Possibly, the best way of using this substance is to convert it into silicate of lime, which is very easily effected. The methods are fully described by Mr. Way in Vol. XIV. of the *Journal of the Royal Agricultural Society*. At Binsted and Selborne, in Hampshire, lime is largely employed on the out-croppings of these silica soils. The farmers there speak highly in praise of its application, while on the gault soils below, they say that lime does very little good. I formerly laughed at them for what I considered their misapplication of lime; but the farmers were right, —for the gault there contains much carbonate and sulphate of lime, while the silica rook, which resembles a piece of impure chalk, contains scarcely a trace of lime. Here, again, practice was in advance of agricultural science. I will not detain your Royal Highness and the meeting by any further remarks, observing only in conclusion, that the earth furnishes supplies of organic as well as inorganic manures, and that our coal-fields might furnish us with an abundance of ammonia, now wasted in the ordinary consumption of coals, and that many of our soils contain latent stores of this valuable article; and if chemists would set their brains to work, and teach us how to avail ourselves of these riches, it would indeed prove a great boon, not only to farmers, but to the community at large.

Mr. J. B. Lawes, F.R.S., said—The period which Mr. Hoskyns has selected as the starting point, in his most interesting and instructive paper just read to us, although comprising so small a portion of time, in the history of British agriculture, refers back to a period sufficiently remote to include the whole history of the chemistry of agriculture, so far as it relates to this country. Whatever might have been known or practised in other countries before that period, certainly neither attracted the attention nor influenced the practice of the agriculturists of Great Britain. It is to an illustrious countryman of His Royal Highness, to Baron Liebig alone, that is due the merit of having effectively roused the attention of British farmers to the importance of applying chemical science to advance the practice of their art. Although fifteen years have elapsed since the first work of Baron Liebig was published, the foundation of this new science can hardly yet be said to be laid, or the first truths admitted without dispute. When we consider the wide distinction which exists between the man of science and the practical farmer, and the very different points of view from which they would regard the use of this new science, it could hardly be expected but that serious disagreements should arise between them. The question of profit and loss naturally enters largely into all the views and considerations of the practical farmer, while the scientific man entirely disregards it. To obtain the same increase in vegetation by the employment of a few pounds of white crystallised salts as would be produced by a cart-load of dung, is to the man of science a phenomenon of great interest, irrespective of any question of cost, but to recommend this salt to be used for agricultural purposes, would depend upon economical questions, having no connection with science. For want of practical knowledge the man of science, although correct in his principles, has often erred in the application of these principles to practice. For want of scientific knowledge the agriculturist has expected from the teachers of science rules to guide and improve his practice, which the science of the day was quite incapable of supplying. Hence the farmer is inclined to regard the man of science as visionary, theoretical, and unpractical, while the man of science accuses the farmer of indifference to science, or applying to it only to furnish him with recipes to enable him to fill his pockets more rapidly. It has of late years been too much the custom to explain everything connected with the practice of agriculture by means of chemistry alone. I would, however, venture to claim for agriculture the rank of an independent science, in close alliance, it is true, with chemistry, botany, physiology, and some other sciences, but still distinct from them all. Its truths can alone be investigated and explained by experiments conducted in the field with all the aids and refinements which modern science affords. It is a science abounding in difficulties, and yielding its fruits but sparingly to those who cultivate it with the greatest assiduity. Although it would not be easy, or even possible, to point out distinctly in what way science has advanced the practice of agriculture from year to year, there is evidence of a very marked progress, if we compare two periods sufficiently remote. When we consider that, ten years ago, it was thought that every description of soil would require special manures to suit them, it is no small addition to our stock of knowledge to have ascertained with certainty that when once we know the most suitable manure for any particular crop, it will be applicable for all soils. The farmer who leaves the light soil of Norfolk to cultivate the heavy clay of Warwickshire, requires no analysis of his soil to tell him that the same artificial manure which he used successfully to grow his wheat on one soil will be equally applicable to the other. I would go further, and say that the same rule would hold good in any part of the world where wheat is cultivated. Ten years ago, nothing certain was known of the value of manures in connection with their chemical composition; at the present time, there are many in this room who would be willing to accept the chemical composition of any manure as the measure of its value. If time permitted, I could point out to you that more correct views are also entertained on the subject of feeding animals; that we begin to know that a rotation of crops is not a necessity, but merely an economical process for obtaining certain ingredients essential to our corn crops. With increased knowledge, the necessity for any fixed routine will be no longer apparent, and the farmer will be free to pursue that system which freedom of competition and fluctuation in price render necessary to enable him to realise the full reward for his skill and capital.

Mr. ALLEN RANSOME said—I have listened with great pleasure to the interesting paper read by Mr. Hoskyns; and in venturing to make a few remarks on that portion of it which is more immediately connected with my vocation as an implement maker, I am desirous to lay before the meeting such facts as will enable it to form a just estimate of the comparative state of agricultural mechanics during the period referred to by Mr. Hoskyns. I do not entirely agree with Mr. Hoskyns as to the amount of improvement which has taken place, within the limited time he has assumed, as coincident with the establishment of the Royal Agricultural Society, nor am I prepared to go the full length of attributing the present state of agricultural mechanics so exclusively to the influence of that body. It is very far from my desire to depreciate the workings of that Society, or in the slightest degree to detract from the vast amount of good it has conferred on the cause of agriculture generally, and to that portion which involves its mechanics in particular, but I should hardly do justice to those who for many years before the establishment of that Society were contributors to the advancement of agriculture through the medium of its mechanics, if I did not avail myself of this opportunity to vindicate the position which they had attained long antecedent to the establishment of the Royal Agricultural Society. The first meeting of that Society at Oxford could hardly be supposed to afford very fair evidence of the state of agricultural mechanics at that period; the Society was little known—its rules less so, its motives doubted, and many held back from contributing to its exhibitions, in order that they might see what others would do, and how they were likely to fare. The meeting was limited certainly, but, limited as it was, at this meeting and the one succeeding, one or more good specimens of all the best implements then in general use were exhibited, and if I might be allowed to lay before you the names and character of the instruments then in use and there exhibited, you will be enabled to judge to what state agricultural mechanics had at that date arrived. There were drills by Garrett, Hornsby, and Smith; ploughs by Ransome, Howard, and Barrett; zig-zag harrows by Howard; portable thrashing machines by Ransome, Garrett, Barrett and Exall, and Hart; winnowing machines by Cooch and Hornsby; clod crushers by Crosskill; turnip cutters by Gardner; haymaking machines by Wedlake; chaff engines of great variety by Cornes, Ransome, Garrett, Richmond and Co., and many others; and rollers of every description. It is no less a fact, that all these implements remain at the present day standard implements, little if at all altered in their principles, though perhaps generally improved in their details. In the subsequent period many new inventions have from time to time made their appearance at the Society's exhibitions, many crudities, and many novelties. Most of these had have their short hour of fame and trial, and eventually have disappeared for ever. Amongst those introduced during the last 15 years, which have since proved their title to be added to the original list of standard implements, the following stand as the most prominent:—Garrett's lever horse-hoes; Grant's, Smith's, and Howard's lever horse-rakes; Bentall's broad share plough; Bushe's, Baxter's, and Phillips's root pulpers; Biddell's bean cutter, and many improvements and varieties of chaff-cutters and of mills. These, with those mentioned as existing previously to the Oxford meeting, may be considered as mainly comprising the class of standard implements of the present day. I have not included in this list the reaping machine, upon which much ingenuity and cost has been expended to adapt it to the requirements of this country, by several makers, because it has not, as yet, assumed the character of a standard implement; but, I think, another season will not pass without at least one specimen which may secure for it that position. Having now, I trust with all becoming modesty, shown the position to which agricultural mechanics had attained—both prior to 1839 and since—I will endeavour to explain the causes to which the present general use of the standard implements is mainly attributable. 1st.—The improvements in all machinery and tools for working in wood and iron, producing a superior style of workmanship at ordinary cost. 2nd.—To the facility of transit afforded by railways. 3rd.—To the necessity of economising all farming costs by means of every labour-saving machine; and last, not least, to the opportunities afforded by the itinerant annual exhibitions of the Royal Agricultural Society, for general observation, test, and comparison of all the best implements throughout the length and breadth of the land. This has enabled the makers of implements in every district to profit by the examples of the best implements of all other districts, and the standard being selected as of the highest class, the best implements have become more generally diffused; the advantage obtained to the agricultural community, arising less from the introduction of new inventions, than from the general adoption throughout the country of the best implements of every district, with a general improvement in the style and quality of workmanship. Hitherto, I have only spoken of the instruments as ordinarily used by horse or hand power; but the introduction of steam-power in its portable form has opened up a wide field for the ingenuity and enterprise of the manufacturer; inasmuch as, by its aid, machines of a much more comprehensive character, which are beyond the limits of ordinary horse-power, can be constructed; and in this direction the energy and the ability of the agricultural machine manufacturer has been largely called into action, and with most satisfactory results, especially in relation to the steam-engine itself, and to the thrashing machine, which combines, with the merely thrashing operation of beating out the corn, the further stages of separation from offal and the production of a perfect sample, fit for market. Important, however, as has been the application of steam power, whether to fixed or portable machinery, greatly more important would it be if it could be brought to bear upon the tillage of the soil. All honour to the inventor of the steam tile-draining machine, who by his persevering exertions has at last effected the first stage of this desirable object; but a very much wider field remains yet to be accomplished in the tillage of land by steam; and honour to all those who have attempted the further stages. The mode in which it is to be accomplished is at present only seen in the distance. There are many and various views as to the best means of effecting it, but certain it is that the experiment is too great for any one individual—too large for individual enterprise. The cost of inventions, of experiments, of trials, and of errors, is enough to drain the deepest purse, and break the strongest heart. I have no hesitation in saying, that if the object is to be accomplished within a reasonable time, as it is a matter that would result in great national good, it should be made a matter of national cost. The funds, I believe, are all that is wanting to bring about some arrangement which will have a practical effect. Until some such general fund is obtained, we shall go on hoping, each hope to end in disappointment. This is not the time nor the place to enter upon the plan, but I should be most happy to confer with any one on the subject, and throw my information into the general fund for the accomplishment of such a desirable end.

Mr. JOHN HUDSON, of Castle Acre, spoke as follows:—I have been requested to speak a few words upon the subject of the progress of Practical Farming during the last fifteen years. The scientific gentlemen who have preceded me this evening have entered so fully into the subject, that they have left me an almost barren field to work upon. I must, therefore, crave your Royal Highness's indulgence to be allowed to allude to the early part of the present century, when Thomas William Coke, the late Earl of Leicester, adopted and recommended the improved system of practical agriculture. At that time the county of Norfolk consisted of large tracts of wild heaths and rabbit warrens. Rye was extensively grown, but very little wheat was produced there. Mr. Coke recommended the farmers to cultivate the turnip crop upon an extended scale, and it was at that time the drill superseded the broad cast method of sowing both corn and turnips. Mr. Coke spent large sums of money in building convenient farm premises for his tenants, and encouraged them to improve their farms by granting them 21 years leases, with liberal covenants. And it was his pleasure, at the latter part of his life, to give his improving tenants the best tenant right they could have—a renewal of their leases four years before the expiration of the term, and that without taking undue advantage of the outlay of the tenants' capital. Up to 1821, he held annual meetings at Holkham, in the month of July, where he gathered around him all the scientific skill and practical experience he could obtain at that time. I have there seen Sir H. Davy, Sir Jos. Banks, Dr. Rigby, and the only agricultural chemist of the day, Mr. Grissenthwaite. They thought there was something "looming in the future," but it remained to the period named on the paper for discussion this evening, for the further development which chemical science has brought to bear upon agriculture. It is to Liebig, Lawes, Paine, Way, and others, that we are indebted for the discovery of the method of converting the hard bone into food for the infant plant of our root crop. In my early days, the turnip crop was a most uncertain one to obtain; but now that our chemists have made these important discoveries, it is almost reduced to a certainty. It was about fifteen years ago that the Royal Agricultural Society of England was formed, under the auspices of his Grace the Duke of Richmond and the late Earl Spencer, Mr. Pusey, and Mr. Handley. That Society has offered prizes for improved implements, as well as improved breeds of cattle, sheep, horses, &c., and held out inducements for chemical science to aid practical farming. When I first put my hand to the plough, it was a very primitive implement, and performed its work imperfectly. Ransome and Howard have improved our ploughs; Garrett has improved Cook's drill and the inverted horse-hoe, which was invented by Francis Blaikie in 1816, and which I first used on my farm at Castle-Acre in 1823. These improved implements have very much tended to the progress of practical farming during the last fifteen years. Ransome, Clayton and Shuttleworth, Hornsby, Tuxford, and others, have brought out the steam thrashing machines. These have greatly lessened the cost of production. The legislature of this country has also done much towards the progress of agriculture. Some twenty years since, the alteration of the tithe-law took place, and labour was set free by the repeal of the old poor-law, without which improved practical farming could not have progressed as it has done. The people require cheap food. This can only be obtained by lessening the cost of its production. The three great items in the farmer's expenditure are rent, labour, and the purchase of artificial manures. As the area of these islands cannot be extended, we must not expect the first to be much decreased, and the labourer is not too well paid. It appears to me that the best way to reduce the cost of agricultural production is to endeavour to obtain the manures at less cost. We are told that many of the uninhabited islands in the Pacific abound in fertilizing matter; and could it be supplied at about half the present price, it might enable the farmers of England to raise an abundant supply of food, both bread, corn, and meat, for the increasing population. I trust the farmers of England will not be considered drones in the busy hive of industry, as, in my opinion, they have endeavoured to keep pace with the advancement of the manufacturing and commercial community of these realms.

H.R.H. THE PRESIDENT said, I feel that I am only carrying out your wishes in proposing to you that we should return our best thanks to Mr. Hoskyns for the very valuable paper which he has read to us. He has given us a very accurate and succinct history of the progress of agriculture, in that peculiarly agreeable and epigrammatic style which is familiar to every one who has read his amusing and valuable little work the "Chronicles of a Clay Farm." He has not only interested and amused us for the hour, but he has given us much to think on; and if he has taught any one lesson of greater importance than another, it is that the future progress of agriculture will mainly depend upon the close and intimate union and the hearty co-operation of science, art, manufactures, and commerce, and that the primary condition of a successful progress for the future will be the obtaining of accurate and complete agricultural statistics. And here I hope I am not trespassing in asking you gentlemen, and every one of you, in his particular circle, to contribute his mite in obtaining those statistics which are so much wanted, and which Government is now trying to collect. I merely repeat our thanks to Mr. Hoskyns for his interesting paper.

Mr. Hoskyns having briefly replied,

The Secretary announced that the paper to be read at the next meeting was "Recent Progress in Design as applied to Manufactures," by Mr. George Wallis, Head-Master of the Birmingham School of Design. On this evening, Mr. Henry Cole, C.B., Vice-President, will preside.

EXAMINATION OF MEMBERS OF CLASSES AT ASSOCIATED INSTITUTIONS.

Mr. John Wood, Chairman of the Board of Inland Revenue, has placed two appointments annually, in the Surveying Department of the Excise, at the disposal of the Council of the Society of Arts. They are to be competed for at the examination which will be held at the Society's house, in the Adelphi, next June.

It may be convenient to those interested in the above announcement to know what qualifications are required for the surveying branch of the Inland Revenue. The following are the Rules laid down by the Commissioners :—

The candidate must, on entering the service, be not less than 19, nor more than 25, years of age. A baptismal certificate, or other satisfactory evidence, will be required.

He must be healthy and active, and without any bodily infirmity. Of this a medical certificate will be required.

He must not be encumbered with debts; and must be unmarried, and without family, and of respectable character; and he will not be allowed to marry until he attains the rank of ride officer.

He must understand arithmetic, so as to work out sums in the rules of addition, subtraction, multiplication, and division, both in common arithmetic and in vulgar and decimal fractions, reduction, proportion, practice, and interest. He must be able to write a good hand, and correctly and fluently from dictation; and have a competent knowledge of book-keeping by double entry.

He will undergo an examination in the above-named subjects, and if approved will be placed under the instruction of an Excise officer for at least six weeks; at the expiration of which period, if he be found qualified to perform the duty of an officer, he will be certified for accordingly, and his salary will commence.

Home Correspondence.

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AN ACCOUNT OF THE INTRODUCTION AND THERAPEUTIC USES OF GLYCERINE.

Sir,—Since the *Journal of the Society of Arts* published the few observations made upon the employment of glycerine during the discussion on Mr. G. F. Wilson's interesting paper upon the products of Price's Patent Candle Company, I have received several communications, seeking further information on the subject, and complaining that the paper in the *Medical Times* journal, for the year 1850, referred to by Mr. G. F. Wilson and myself, was out of print. Will you, therefore, oblige me by reproducing this account of the introduction and therapeutic uses of glycerine, as it will not only answer these inquirers, but will also be found to have anticipated much, if not all, that has been said or written by others, either in this or other countries, upon the medical uses of the liquid under consideration.

To my friend, Mr. Thomas De la Rue, who was employing glycerine in the arts, I am indebted for first directing my attention to this useful agent, when a consideration of its properties and nature at once suggested its applicability for the purposes for which I have recommended it, and which subsequent experience has verified. Glycerine was at that time, 12 or 13 years ago, a waste product formed in making diachylon plaster; indeed, in its pure form, it was a sort of chemical curiosity, in so much that when my desire to obtain a quantity of it was mentioned to some of the chief chemists of London, at an assemblage of the Pharmaceutical Society, in 1845, a few pounds only could be procured; and had not Mr. Button, of Holborn, and Mr. Thomas Taylor, of Vere-street, undertaken its manufacture for me, this important addendum to our list of therapeutics would probably have remained in statu quo, and this part of the profits of Price's Patent Candle Company in abeyance.

The following is the first published notice of glycerine; it occurs in a lecture on *Pityriasis*, or dandriff of the skin, delivered by me at the Hospital for Skin Diseases, in 1845, and is printed in the *Medical Times* journal, vol. 13, 1846, and is afterwards repeated, with additional matter, in the 21st vol. of the same journal, for the year 1850, from which the subjoined extracts are made (page 27 *et seq.*) :—

"Another very efficacious means remains to us in glycerine, which, as a palliative in squamous affections of the skin, has not, to my knowledge, been hitherto made known or adopted; in fact, it is peculiar to myself; and although I have not as yet addressed the profession or any learned body on the subject, in accordance with my intention, when my observations are matured, I will, nevertheless, here announce it for your consideration. It consists in the employment of this liquid I hand round, discovered by Scheele at the end of the last century, which has the property of remaining fluid, and resisting evaporation under any temperature to which the body can be exposed; indeed, I have wetted a common dinner plate with it, and kept it in an oven whilst a joint of meat was cooked by its side, and the liquid has experienced no evident change or diminution. The facility with which this body mingles with water or other fluids, even oils, renders it an invaluable adjunct to lotions, poultices, embrocations, and applications, the utility of which may consist, not only in diminishing temperature by evaporation, but in softening and relaxing the heated and inflamed skin. The tendency to dry up, and adhere to the part, as is well known, often frustrates the beneficial effects of these applications, and various counter-active expedients have consequently been adopted, as the addition of fatty matters, or covering the poultice, lotion, &c., with oiled silk. Now this is rendered entirely unnecessary by the addition of the liquid I have submitted for your inspection. You will perceive glycerine has the appearance of oil, and when rubbed upon the skin it furnishes a thin coating, or varnish, which even the *microscope* fails to distinguish as different from the ordinary secretions of the part. Half an ounce of this liquid, added to half a pint of lotion, will prevent the skin becoming dry. In baths the result is also equally apparent, but here the cost is an obstacle, though the liquid is by no means dear,[*] as, at the present time, tons of it are thrown away, but if, as I anticipate, its application prove general, its price will be shortly augmented. This fluid body, to which the chemists have given the name of glycerine, is a peculiar, uncrystallisable, unfermentable saccharine matter, found in animal fats or oils, and produced during their admixture and combination with alkalies, earths, or oxides. Thus it is most abundant in the refuse of the soap and stearine maker. That which you are now inspecting was procured from Apothecaries Hall, and is formed during the manufacture of lead plaster on a large scale. *I should mention, that it requires to be diluted with water for use, otherwise it*

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[*] The price then paid for tolerably pure glycerine was 1s. 6d. per pound.—J. S.

> *makes the skin feel stiff, uncomfortable, and sticky*, but as I am now about concluding some experiments, long since commenced, on the application of this liquid as a therapeutic agent to several forms of cutaneous disease, I will defer any further observations on it till a future occasion. In the meantime, I shall be obliged if any professional brother will give it a trial in his practice, and communicate to me the result."

To redeem the pledge thus given, two years afterwards the pages of the same journal (*Med. Times*, vol. XVI., p. 469) contained a renewal of the subject, when, after describing the mode of preparing glycerine, and its chemical composition, I gave the subjoined summary of its therapeutic uses :—

> "In the use of glycerine internally I have had little experience, but it is a mild stimulant, antiseptic, and demulcent, and might be employed to sweeten many articles of food or drinks for those invalids whose disordered digestive organs forbid the use of sugar. Pills made with the addition of a few drops of glycerine will not become dry, and syrups and extracts by its means are kept moist, as also free from fermentation, and the formation of cryptogamous vegetation, or mouldiness. Many other such like uses for this agent will not fail to suggest themselves, for the recapitulation of which, however, the pages of a medical journal can scarcely be deemed the appropriate place. I shall, therefore, briefly enumerate some of the diseases of the skin in which I have employed glycerine as a *local palliative* with most benefit and success. These are, Pityriasis, or dandriff, particularly that form of the disease which I have termed (P. congenita), Lepra, Psoriasis, Lichen (in its advanced stage), Eczema, Impetigo, and Prurigo. I have found glycerine also a useful addition to lotions in the encrusted forms of Lupus, or Herpes Exedens, and to various Syphilitic or Strumous eruptions, having a tendency to produce fœtid discharges and hard crusts, for which reason, also, it has proved of service in the scabbing stage of small pox, to prevent scars and pitting. As a wash also for the hair, and for chapped hands, face, or nipples, combined with a little rose-water, and a few grains of borax to the ounce, the glycerine being in the proportion of one-eighth to one-sixteenth, this remedy furnishes, perhaps, *one of the most elegant and efficacious preparations which has been introduced.* If may also be combined with soaps, which it renders peculiarly softening and detergent, particularly for individuals who have a hard or dry skin."

> "To this somewhat lengthy communication I will only add, for the guidance of those amongst your readers who may desire to make trial of this remedy, a few of the more common and useful formulæ employed at the Hospital for Diseases of the Skin, where glycerine is extensively used, notwithstanding its present high price (3s. to 5s. per lb.) proves a considerable obstacle, the funds of this Institution being quite inadequate to meet the increasing demands upon them. I would premise that glycerine should *rarely ever be used undiluted* for cutaneous maladies, and that when prescribed in the annexed recipes, *the pure inodorous and anhydrous quality* is alone indicated, which is of a pale sherry colour, and of the consistence of treacle, care being taken not to employ a spurious article lately found in the shops, composed chiefly of honey, or sugar, gum, and water."

Here follow some Latin prescriptions, in the *Medical Times* Journal, of which I translate a few for domestic use.

For superficial burns, scalds or excoriations, tetters of the lips, nose, &c., after colds.—Take of gum tragacanth half an ounce, pure glycerine one ounce, lime water two ounces, double rose water enough to form a soft jelly, to be used by way of ointment or embrocation.

For chapped hands or nipples, fissures of the lips, irritation of the skin of any kind, as after shaving or exposure to the sun, or for roughness, scurf, or dandriff, on any part of the skin.—Take of borax half a drachm, pure glycerine half an ounce, rose, elder, or orange flower water half a pint, to be used as a lotion, with soft sponge or linen, to dab the affected parts.

For baldness following fevers, or other severe illness, or for falling of the hair from dryness and want of action in the scalp.—Take of strong spirits of sal volatile one ounce, tincture of cantharides two drachms, rosemary water half a pint, and pure glycerine half an ounce, to be used with a sponge or wetted hair brush twice a day.

For rheumatism, gout, bruises, sprains, stiffness, &c.—Take equal parts of pure glycerine and camphorated oil, or opodildoc, or chloroform, and use as an embrocation to the affected parts.

Of course this list might be greatly augmented, but enough has been stated to show the mode of using a remedy which I cannot have employed less frequently than in 15,000 cases, amongst nearly 70,000 patients who have been treated by me, during the last fifteen years, for various forms of skin complaints at the hospital under my care; and I must say I have found it, when applied according to the foregoing principles, *one of the most useful applications* AS A PALLIATIVE *in these afflictive maladies.* I have also, as mentioned to the Society of Arts, applied glycerine efficaciously, alone or combined, for frost bites, chilblains, &c.; and also as a means for embalming, both for purposes of dissection, and for preserving objects of natural history; as also in the preparation of salt meats, as well as in extracts, confections, pills, distilled waters, &c., kept by apothecaries; in short, as a substitute for spirits of wine, vinegar, and syrups, the latter of which, in medical preparations, it might advantageously supersede, the cost permitting. The only marked advantage I have witnessed from the internal administration of glycerine has been in some forms of indigestion, and as a vehicle for taking cod liver and other oils; and patients suffering from that ordinarily fatal complaint Diabetes, have derived benefit and comfort from its use. It would be remiss to conclude this notice without expressing my obligations to Mr. Geo. F. Wilson, of Price's Patent Candle Company, for the scientific improvements he has effected in the manufacture of glycerine, which has rendered this remedy not only much more certain, because purer, but much cheaper for the general public, though it is hoped the cost may be still further reduced; whilst the liberality of his company, *in gratuitously furnishing an ample supply of pure glycerine to the afflicted poor attending the Skin Hospital*, deserves and receives the warmest acknowledgments of myself and the committee of management conducting that institution.

I am, Sir, your obedient servant,
JAMES STARTIN.

IRON FOR ORDNANCE.

Sir,—Perceiving no reply to Lady Bentham's query respecting the carronades on the experimental vessels of 1795, I beg to state there can be little doubt they were cast with mineral fuel. The Carron works were erected about the year 1767, by Dr. Roebuck, for the then newly established manufacture of pit coal pig iron, a revival of the patents of Dudley in 1619. Dr. Roebuck, the grandfather of the present M.P. for Sheffield, was a man of the largest capacity, liberality, and enterprise, and his life furnishes a strong incidental instance of what appears inevitable, that he who carries the pence also carries the praise. Dr. Roebuck was the first partner with James Watt, made large advances upon the then improved prodigy which was destined to revolutionise the world, and by his intelligent advice was of the greatest assistance in perfecting it. He subsequently released to Watt his share (two-thirds) of the patents on very liberal terms; and a share of the invention thus tested and completed by Dr. Roebuck's penetration and capital was subsequently purchased by Matthew Boulton. Boulton's name thus becoming linked with the commercial success of the invention, it is he alone who is spoken of by fame as the intelligent capitalist who appreciated and selected for investment the hidden and even despised offspring of Watt's genius; whereas it is to Dr. Roebuck that this first merit is actually due. Boulton was liberal and intelligent, and had the acuteness to make an excellent outlay, but he holds by right only the second place as the appreciator of Watt. I believe Dr. Roebuck's first attempts at Carron were not successful, in fact the range of his faculties carried him into too many enterprises at one time, but I very much doubt if any charcoal pig iron was ever made at those works, certainly not in the last decade of the century, for the Carron manufactures of pit coal iron had thoroughly established their character prior to 1780. Nothing can be more vague, more unsound, partial, and inconclusive, than the scattered notices which have been flying through the daily press, that the manufacture of cannon from charcoal or peat iron, must be resorted to here, to enable our artillery to compete with the Russian guns. Not one hundredth part of the evidence necessary to establish the real facts, or to come to any correct conclusion, have even been adverted to in these discussions and suggestions.

I am, Sir, your obedient servant,
DAVID MUSHET.

Feb. 17, 1856.

Proceedings of Institutions.

Boston.—The annual meeting of the members of the Athenæum was held on Friday, the 15th of February, Mr. T. Garfit, president of the society, in the chair. From the annual report of the committee, it appears that some time during the approaching summer, the new building now erecting in front of the Corn Exchange will be ready for the accommodation of the members. In the fitting up of this building the Committee expect considerable expense will be incurred, for which purpose donations are solicited from the more affluent members. The failure of a scheme for the formation of an union of the Literary Societies of Lincolnshire, as proposed by the Society of Arts, is regretted. The financial report is very satisfactory, there appearing to be a balance in the hands of the treasurer of £99 13s. 2d. (exclusive of £40 balance of Exhibition account). A small increase in the number of members is also noted, and a suggestion thrown out by which it is hoped the number may be considerably increased during the ensuing year. A classified list is given of the members; out of the total number (450) there appears to be only 11 mechanics, the class for whose benefit the society was originally established. There are 174 merchants and tradesmen, 78 clerks and assistants, 67 farmers and country members, 12 clergymen, 8 magistrates, 19 independent gentlemen, 30 bankers and professional gentlemen, 11 schoolmasters, 1 member of Parliament, and 44 youths under 21; 19 gentlemen are annual subscribers of one guinea. There are 5 daily and 30 weekly papers now provided for the reading-room, the attendance in which has largely increased. The introduction of telegraphic despatches, it is suggested, would add to the interest of the reading-room. The number of books in the library is 2,100, and 500 books have been received from the London library. The total number of issues has amounted to 8,946—a slight decrease on the preceding year. The very handsome donation of 120 vols., by Mr. T. Garfit, in October last, is noticed. There have been 825 issues of these works, and as a table is appended showing the number of times each work has been issued, it gives some idea of the taste of the reading public in Boston. Bulwer Lytton's novels have been in the greatest demand, they have been issued 298 times; Dickens' works rank second, having been issued 127 times; Captain Marryatt's are third, 94 times; Cooper's works have been called for 35 times, Warren's, 25, and Carlyle's, 27. To show how much more the public are interested in history and exciting tales than in more intellectual works, it need only be stated, that while the Cruise of the Midge has been read 17 times, the Ingoldsby Legends 14 times, Southey's Admirals 16 times, and Carlyle's French Revolution 13; Smyth's Lectures on Modern History have only found 2 readers, Ansted's Ancient World and Ruskin's Architecture an equal number. Poetry appears to be a drug, for Longfellow's Poems have only been read 3 times, Bailey's Festus, 3 times, and Macaulay's Lays 5 times, while the same gentleman's Essays have found 16 readers. The committee regret the failure of the attempt to form classes among the young men, but trust that with the increased accommodation in the new building, and the scheme of the Society of Arts of public examinations for the purpose of granting certificates of merit (such certificates to bear a commercial value), will have a beneficial effect. The report concluded by stating that the committee are of opinion that, "whilst in its financial condition the Institution has improved, it has also in its general progress been as satisfactory as, from the very limited accommodation, could be expected. It still enjoys the confidence of the public in a high degree, and although in its present rooms it is not possible to do much by way of extending its usefulness, yet it is gratifying to know that even with this drawback it ministers somewhat to the progress of education, and to the advantage of all classes of the community." At the conclusion of the reading of the address, votes of thanks were proposed and carried to the lecturers, Mr. T. Garfit, president, and the committee and officers.

London and South-Western Literary and Scientific Institution.—At the sixth annual general meeting of the members of this Institution, held on Thursday, the 14th February, Mr. F. J. Macaulay in the chair, the report of the committee and statement of accounts for the year ending 31st December, 1855, were read. The report commenced by alluding to the accounts. It was stated that for the future it was proposed to keep the Institution and the School accounts perfectly distinct and separate. The report then went on to say that the committee do not desire to see a large balance to the credit of either account, believing that the interests of the Institution would be better consulted by a generous distribution of its funds, on such legitimate objects as might come within the means of the committee. The committee regret that the classes have not received that support and encouragement to which they are entitled, and they state that should the experience of the current year show no improvement in the receipts of the classes, it will be their duty, with a view to the protection of the interests of the Institution, to discontinue such classes as entail an undue loss upon its funds. The committee then direct attention to the scheme proposed by the Society of Arts, for the examination of classes in connection with Institutions, with a view to the distribution of such certificates of merit among the members as may prove of value to them in whatever profession or employment they may be engaged. The library of the Institution has not lately received any renewals or additions, so necessary to its proper maintenance and development. During the past year 11 lectures have been delivered at this Institution, of which 2 have been on planets, 1 on electricity, 1 on physiology, and 7 on miscellaneous subjects of general interest. In addition to these lectures, there have been 3 readings of Shakspeare and Bulwer, and 3 musical entertainments. The attendance of members and their friends on these occasions has been generally numerous and satisfactory. The evening school is stated to be in active operation. Various resolutions were then passed, the different officers were re-elected, thanks were voted to the railway company, to the committee and officers, and a life membership was conferred on Mr. J. F. Macaulay, in recognition of the long, zealous, and valuable services rendered by him to the Institution as its honorary secretary.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 28th February, 1856.]

Par. No.
53. Post-Offices (Dublin and Edinburgh)—Copies of Correspondence.
62. Poor Law (Ireland)—Returns.
66. Army (Crimea)—Copy of Royal Warrant appointing a Board of General Officers.
46. Bills—Partnership Amendment (Amended).

50. Bills—Secretary to the Poor Law Commissioners (Ireland).
52. Bills—Trial of Offences.
57. Bills—Annuities.

Delivered on 29th February, 1856.

51. Staff Officers—Return.
53. Bills—Summary Jurisdiction.
47. Bills—Joint Stock Companies (Amended).
Criminal Offenders (England and Wales)—Tables.

Delivered on 1st and 3rd March, 1856.

60. Joint Stock Companies—Returns.
67. Sandhurst Royal Military College—Return.
71. Oxford University (University College and Brasenose College)—Copies of Ordinances.

To Correspondents.

◆

Erratum.—In last No., page 262, line 11, for "*for feeding cattle,*" read "*as a dressing for wheat.*"

MEETINGS FOR THE ENSUING WEEK.

Mon. London Inst., 7, Mr. John Ella, "On Vocal and Instrumental Music."
Architects, 8, Mr. G. J. Wigley, "Archæological Studies in Jerusalem."
Geographical, 8½, 1. Mr. W. Kennet Loftus, "Notes of a Journey from Bagdad to Busrah, with descriptions of several Chaldean Remains." 2. Mr. Keith E. Abbot, "Notes taken in a Journey Eastwards, from Sheraz to Fessa and Darab, and thence Westwards by Jehroom to Kazeran, in 1850."

Tues. Royal Inst., 3, Prof. Huxley, "On Physiology and Comparative Anatomy."
Syro-Egyptian, 7½, Mr. Marsden, "On Roman Emperors Egyptian names, &c."
Civil Engineers, 8, Mr. W. Heinke, "On Improvements in Diving Dresses and other Apparatus for Working under Water."
Med. and Chirurg., 8½.
Zoological, 9.

Wed. Literary Fund, 2. Anniversary.
London Inst., 3, Prof. Rymer Jones, "On Entomology and the General Organisation and Metamorphoses of Insects."
Society of Arts, 8, Mr. George Wallis, "The Recent Progress of Design, as applied to Manufactures."
Graphic, 8.
Ethnological, 8½.
Royal Soc. Literature, 8½.

Thurs. Royal Inst., 3, Professor Tyndall, "On Light."
London Inst., 7, Mr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Royal, 8½.

Fri. Astronomical, 8.
Philological, 8.
Royal Inst., 8½, Rev. J. Barlow, "On Aluminium."

Sat. London Inst., 3, Mr. E. W. Brayley, "On Geology."
Royal Inst., 3, Professor Odling, "On Organic Chemistry."
Statistical, 3. Anniversary.
Medical, 8.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette February 29th*, 1856.]

Dated 3rd January, 1856.

20. Hermann Brambach, Cologne—Converting dry pitch, and other resinous substances, also coal tar and other tars, into neutral essential oils.

Dated 2nd February, 1856.

289. James Townsend Ward, Swansea—Improved omnibus.
293. William Joseph Curtis, 1, Sebbon-street, Islington—Improvements in machinery for excavating land for the constructing tunnels.

Dated 4th February, 1856.

296. Richard Clarke Pauling, 18, Great George-street, Westminster—Expelling water from vessels and keeping them from sinking, raising sunken vessels, keeping water out of coffer dams, caissons, foundations, or vessels, or works that are below water, and propelling vessels on and through water.
297. Rudolph Bodmer, 2, Thavies-inn, Holborn—Improved lubricating oil. (A communication.)
299. Elisha Smith Robinson, Bristol—Improvements in machinery for lithographic and zincographic printing.
300. Charles Henry Hudson, 4, Highbury-cottages, Holloway-road—A retiring door or lid for boxes, cabinets, closets, rooms, carriages, and for all places or receptacles where or in which doors or lids are at present in use or may be used.
301. Edwin Clark, 24, Great George-street, Westminster—Improvement in the apparatus for suspending insulated electric telegraph wires.
303. John Thomson, Newton-le-Willows—Improvements in centrifugal apparatus to be used in the separation of liquids from granular and crystalline matters.
305. William Allen Turner, 125, Wood-street, Cheapside—Improved preparation or mixture to be used in the manufacture of compounds of india rubber or caoutchouc.

Dated 5th February, 1856.

307. George Cumins Thomas, Washington, U.S.—Improved method of hardening and tempering steel. (A communication.)
309. Thomas Hinchliffe, Mill-bridge, Liversedge—Improvements in machinery or apparatus for "drawing" and "spinning" wool or other fibrous substances, or wool mixed with other fibrous substances.
311. Theodore Bergner, Philadelphia, U.S.—Embossing veneers, so as to represent carvings in wood. (A communication.)
313. James Howard, Bedford—Improved apparatus for making moulds for castings.
315. Alfred Augustus De Reginald Hely, 296, Oxford-street—Improvements applicable in the burning of gas.
317. Henry Squire, 41, Ludgate-hill—Improved seal or fastening for envelopes, deeds, and documents.

Dated 6th February, 1856.

319. Joseph Thomas, Finsbury-square—Improvements in the manufacture of soap from the greasy matters obtained from the refuse water, wash, or suds, used in woollen or other manufactures or processes. (A communication.)
321. John Fletcher and William Fletcher, Salford—Improvements in the construction of weighing cranes and other similar elevating machines.
323. Henry Alfred Jowett, Kentish-town—Improvements in railway breaks and carriages, and in signals connected therewith.
325. Thomas Frederick Tyerman, Weymouth-street, Portland-place—Improvements in apparatus to be applied to omnibuses and other carriages for receiving wet umbrellas.
327. James Edward Duyck, Wandsworth—Improvements in the manufacture of oil cake.
329. James Meacock, Snow-hill—Improved means of fixing diaphragms in gas meters.

Dated 7th February, 1856.

331. Theodore Bergner, Philadelphia, U.S.—A new mode of preparing or facing surfaces of engraved or etched plates of metal, or other substance, so that they may be readily printed from by a press without wiping. (A communication.)
333. Richard Archibald Brooman, 166, Fleet-street—A method o obtaining alcohol from the fruit or pod of the Carob tree. (A communication.)

Dated 8th February, 1856.

335. John Woodman, Manchester—Improved telegraph insulator.
336. Theophile François Trocard, Bordeaux-town—Improved coffee-pot.
338. Henry Alfred Jowett, Kentish-town—Improvements in rails used for the construction of the permanent way of railways, and in the means of laying down and fixing them in conjunction with the present rails in use.
339. Stewart Robertson and James Howden, Glasgow—Improvements in machinery or apparatus for driving piles.
340. Charles Walker, Glasgow—Improvements in safety valves and in apparatus for cleansing or purifying water in steam-boilers.
341. John Billington Booth and James Beckett, Preston—Improvements in machinery for preparing and spinning cotton, wool, and other fibrous materials.

Dated 9th February, 1856.

342. Charles Swan and George Frederick Swan, 49, High-street, Southwark—Improved colouring matter for writing, staining, or dyeing, which is also applicable to the production of a copying fluid. (A communication.)
344. George Wailes, 10, Palace-row, New-road—Improvements in the construction of valves for regulating the passage of gas and other fluids.
346. John Rawlings, Bishopsgate-street—Improvements in envelope or stationary cases.
347. Edward Martin, Oxford—Improvements in cricket-bats.
348. Theophilus Burton, Lincoln—An internal boiler cleaner or mud stirrer for the effectual cleaning of steam-boilers from muddy deposits and all kinds of sediments.
350. Louis Schwartzkopff, Berlin—Improvements in apparatus for raising mud and soil from the bottoms of rivers and other waters.
351. William Augustus Bullard, Dedham, Massachusetts, U.S.—Improvements in instruments for fastening doors. (Partly a communication.)

Dated 11th February. 1856.

352. Christophe Muratori, Paris—Improvements in the waterproofing of hangings or ornamenting stuffs.
353. William Horatio Harfield, 113, Fenchurch-street—Improvements in the manufacture of metallic screw nuts. (A communication.)

Dated 12th February, 1856.

356. Henry Bessemer, Queen-street-place, New Cannon-street—Improvements in the manufacture of malleable or bar iron and steel.
358. George Tomlinson Bousfield, Sussex-place, Loughborough-road—Improvement in treating fats and oils. (A communication.)
360. Felix Pruss Jablonowski, Brussels—A new process of chromo-lithographic painting on glass, porcelain, clays, lava, and other materials susceptible of vitrifaction, and on all metals and metallic compounds capable of receiving an enamelled surface.

Dated 13th February, 1856.

362. Pierre Isidor David, Paris—Improvements in the method of bleaching.
364. Louis Vignat, 3, Place des Victoires, Paris—A regulator-compensator for the weaving of ribbons and cloths.
366. Samuel Fox, Stocks bridge, Peniston, York—Improvements in springs for railway and other carriages.
368. William Gilchrist, Kirkintillock, Dumbarton—Improvements in ornamental weaving.
370. William Edward Newton, 66, Chancery-lane—Improvements in the construction of fire-arms. (A communication.)
372. Henry Fort Mitchell and William Mitchell, and John Clarkson, Silsden, near Keighley—Improvements in sewing machines.
374. Gustave Louis Keller, Paris—A new kind or system of carpet or travelling bag.

Dated 14th February, 1856.

376. Thomas Parkinson Capp, 67, Gracechurch-street—Improved lamp.
378. Henry Robert Ramsbotham and William Brown, Bradford—Improvements in combing wool, alpaca, cotton, and other fibrous substances.
382. George Pate Cooper, 18, Sutherland-square, Walworth—Improved shirt collar.
384. William Hammond Bartholomew, 15, Brunswick-terrace, Leeds—Improvements in propelling vessels when screws or submerged propellers are used.
388. Charles Cowper, 20, Southampton-buildings, Chancery-lane—Improvements in impregnating wood with preservative and colouring materials, and in apparatus for that purpose. (A communication.)
390. Edouard Deiss, Paris—A method or methods of, and apparatus for extracting oils, fats, greases, and resins from bones, raw wool, seeds, and other substances containing the same, and recovering a certain agent employed in the process.

Dated 15th February, 1856.

392. Alexandre Tolhausen, 7, Duke-street, Adelphi—A machine for cutting articles of polygonal figure in wood or other material. (A communication.)
394. James Hogg, junior, 4, Nicolson-street, Edinburgh—Improvements in the manufacture of envelopes and certain other combinations and applications of paper and gum, denominated "Letter Checks," for containing and securing written, printed, or other communications.
396. Eddlestone Elliott, Cyrus Leach, and James Ratcliffe, Rochdale—Improvements in machinery for spinning wool and other fibrous substances.
398. William Edward Newton, 96, Chancery-lane—Improved machinery for making boots and shoes. (A communication.)

Dated 16th February, 1856.

400. Frederic Daniel Grant, Newgate-street—A method of rendering printing inks and wax odoriferous.
402. George Harrison, 4, Little Goodwin-street, Hull—Improvements in axles for railway carriages.

Dated 18th February, 1856.

406. James Strang Thomson and Andrew Barclay, Kilmarnock—Improvements in printing and embossing textile fabrics and other surfaces, and in the production of apparatus to be employed therein.
408. Moses Jones, William Broad Rowe, and William Perrins, Broad-street, Worcester—Improvement in ranges.
410. William Hale, Swan-walk, Chelsea—Improvements in propelling boats or other floating bodies.

Dated 19th February, 1856.

412. Henri Gerbaut, Mulhouse—Improvements in the manufacture of vinegar.
414. Frederick Austin Spalding Witter, Manchester—Improved stove. (A communication.)
416. Stephen Fitchew Cox, Bristol—Improvements in the manufacture of leather, and in machinery for that purpose.
418. John Gedge, 4, Wellington-street South, Strand—Improvements in pumps. (A communication.)
420. William Gwillim Merrett, 49, Leadenhall-street—Improvement in trowsers and drawers.
422. Richard Waygood, Newington-causeway—Improved portable laundry, or combined boiling, washing, mangling, and drying and ironing apparatus.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

423. William Aristides Vérel, Macduff, Banff—Improvements in grinding or pulverizing hoofs and horns, and in using them alone or mixed with pulverized bones for manure.—20th February, 1856.
481. Louis Arnier, Marseilles—Improvements in condensing hot air and obtaining motive power therefrom.—25th February, 1856.

WEEKLY LIST OF PATENTS SEALED.

Sealed February 29th, 1856.

1953. John Hanson.
1955. James More.
1959. Charles Frederick Stansbury.
1968. George Frederick Rose.
1971. Matthew Butcher and Thomas Henry Newey.
1977. Thomas Symes Prideaux.
1979. Alfred Vincent Newton.
1983. George Thomas Holden and Richard Nicholas.
1984. Thomas Joseph Larmuth and John Smith.
1988. William Henry Zahn.
1991. John Humby.
2017. Christopher Penrhyn Aston.
2053. Henry Bull.
2059. Etienne Charles Zacharie Bouchard.
2083. Henry Chandler.
2085. David Hill.
2103. Charles Tilston Bright and Edward Brailsford Bright.
2207. Richard Archibald Brooman.
2335. William Glass.
2404. Joseph Hands.
2425. James Gray Lawrie.
2628. Henry William Wimshurst.
2705. Edward John Davies.
2723. Samuel Garn.
2863. Alfred Vincent Newton.
2889. John Watson.

Sealed March 4th, 1856.

1999. Thomas Taylor Coniam.
2008. William Craymer.
2013. Joseph Gilbert Martien.
2014. Ichabod Nettleship.
2016. Theodore Schwartz.
2021. George Lowry.
2036. Anguish Honour Augustus Durant.
2038. Anguish Honour Augustus Durant.
2040. Anguish Honour Augustus Durant.
2042. Henry Webster.
2056. François Honoré Lebaigue.
2086. William Sangster.
2088. David Zenner.
2110. William Warren.
2116. Richard Archibald Brooman.
2130. John Moreton Machinton.
2157. Charles Victor Théry.
2180. Charles Ratcliffe.
2281. Robert Henry Kay and Alfred Thomas Richardson, and George Mallinson.
2315. James Fraser.
2580. Duncan Morrison.
2727. Joseph Barling.
2798. Reuben Levy.
2803. Samuel Clarke.
2875. George Harvey.
2884. John Barcroft.
2922. Sylvanus Sawyer.
2946. William Lange.
10. Richard Albert Tilghman.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

February 25th.

477. William Symington.
571. Thomas Weatherburn Dodds.
574. Thomas Weatherburn Dodds.

February 26th.

514. John M'Adams.
535. Samuel Colt.
538. Samuel Colt.
654. Samuel Colt.
719. Charles Augustus Holm.

February 27th.

522. Edward Duke Moore.

February 28th.

525. Robert Waddell.
526. Marcel Vetillart.
542. Thomas Crick.
562. Richard Barter.
594. Samuel Blackwell.
595. Samuel Blackwell.

February 29th.

510. William Edward Newton.
592. James Kimberley.

March 1st.

532. Robert Barclay.
75. Augustino Carosio.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3813	March 4.	The Combined Copying Press and Inkstand	Sampson, Mordan, and Co...	22, City-road, London.
3814	March 5.	Cliver or Hariff Apparatus	William Sawney	Beverley, Yorkshire.
3815	March 5.	Improved Elastic Boot Fastening	Butterworth and Co.	2, New Dover-street, Southwark.